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GONORRHEAL VULVO-VAGINITIS IN CHILDREN.*

WITH SPECIAL REFERENCE TO AN EPIDEMIC OCCURRING IN SCARLET-FEVER WARDS

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HISTORICAL

THERE is no disease that has had a more varied history or that has passed through stages more confused and contradictory than gonorrhea. Throughout ancient history and up to the end of the Middle Ages it was apparently recognized in its true character as a specific and communicable disease, but the awakening of medical science during the fifteenth century had the curious result of obscuring rather than enlightening this particular field, and gonorrhea came to be hopelessly confounded with the far more striking disease, syphilis. It is interesting to note that one of the earliest attempts at experimental medicine, Hunter's famous inoculation experiments with syphilis, served to strengthen enormously this erroneous conception, for the virus used by Hunter evidently came from a case of mixed infection and both gonorrhea and syphilis resulted from the inoculation. From this time on we find gonorrhea regarded only as a symptom of syphilis, and the subject does not emerge from this stage of confusion until well on into the nineteenth century when, chiefly through the work of Ricord, the two diseases are at last recognized as distinct.[1]

The next stage in the history of gonorrhea is that of controversy over its specificity and infectious character, and is filled with observations and experiments tending to prove that gonorrheal pus is not the same as ordinary pus, and cannot be produced by inoculation from ordinary pus or by ordinary irritants. This point having finally been proved beyond controversy, it remained to discover the specific cause. Neisser's discovery of the gonococcus in 1879 was finally and universally accepted only after Bumm's publication, in

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* Received for publication February 27, 1908.

[1] There is an interesting review of the old literature in Epstein's monograph. See references at end of article.

1884, of his work in successfully growing the gonococcus in pure culture on artificial medium and producing gonorrhea by inoculation experiments in human beings.

Since then the history of gonorrhea has been the history of a disease gradually increasing in importance. One after another serious lesions in various parts of the body and fatal general pyemia have been found to be caused by gonococcal infection. The highly contagious nature of the disease has also come to be recognized and, of late years, its extreme chronicity and obstinacy.

The history of gonorrhea in children has passed through the same stages as that of gonorrhea in adults, only it has always halted behind and often dropped into complete obscurity. Two things have contributed to retard the clearing-up of this subject. First, the apparently insignificant character of the disease in children and, second, the firmly rooted belief still persisting in the popular mind, that gonorrhea can be conveyed by sexual contact only. The first of these, the belief that leucorrhea in childhood is of slight importance, must explain why it is that we find so few references to it in the early literature. Occasionally some unusually observant physician will note the occurrence of a "fluor albus" which has apparently been communicated by a mother to her child, or which has caused a home or asylum epidemic, but such references are very few. The textbooks on children's diseases up to about 1892 made no mention of infectious vulvo-vaginitis.

Later on we find the subject increasing in importance, but not in clearness. Long after the medical world had accepted the distinction between syphilis and gonorrhea, it continued to regard leucorrhea in little girls as a symptom of hereditary syphilis. When it was finally recognized that gonorrheal infection was possible in childhood it was held that sexual contact alone could be responsible for such infection, and the question then became involved in medico-legal complications. If the vaginitis of a little girl were gonorrheal it must mean that criminal assault had taken place; if none had occurred, the vaginitis must be non-gonorrheal. Neisser states that one of the arguments used against the etiological significance of the gonococcus was the occurrence of cases of vaginitis in institutions for little girls, where there was no possibility of venereal infection. This view has held sway until very recent years and we find traces of it still in the literature. The vulvo-vaginitis of little girls was admitted to be communicable and probably specific, but inasmuch as it was non-venereal it could not be caused by gonorrheal infection. Scrofula, anemia, marasmus, or the acute exanthematous diseases, or various skin infections were usually regarded as causing it, even when it appeared in epidemic form.

The report published by Atkinson in 1879 is always quoted as the earliest detailed account of an epidemic of infectious vulvo-vaginitis and ophthalmia in little girls. It is Atkinson's great merit that he recognized the connection between the stomatitis and ophthalmia, which had appeared sometime before in the institution, and the sudden outbreak of vulvo-vaginitis. The infectious agent he thought had been carried by the children's fingers from eyes and mouth to vulva. Atkinson called the disease "vulvitis due to a specific contagion other than venereal," sharing the view general at that time that gonorrheal infection was necessarily venereal. Even after the discoveries of Neisser and Bumm had made it possible to determine the real nature of any vaginal discharge, we find this same impression prevailing. Thus Leszynsky describes an epidemic of vulvo-vaginitis affecting 212 little girls in a charitable institution. The disease was evidently highly contagious and there were 18 cases in which ophthalmia developed, but Leszynsky found no evidence that it was "specific" and thought that it arose from uncleanness, scrofula, anemia, etc. Bouchut also recognized the contagiousness of leucorrheal discharges in little girls and the occurrence of the disease in epidemics, but he, like Atkinson, assumed a special infectious agent, a "contagion leucorrhéique," which he believed to be transmitted in various ways, among others by the air.

Fraenkel in 1885 was the first to make bacteriological studies of the vaginal discharge of little girls, using the cases which occurred in a hospital epidemic in Hamburg, but although he succeeded in finding in the discharges an organism morphologically identical with the gonococcus of Neisser, he denied its real identity on the ground of its slight virulence. The disease in his youthful cases was not as serious as the gonorrhea of adults, and as further argument, Fraenkel adduces the fact that he failed in his attempt to produce ophthalmia in three moribund cases by rubbing vaginal pus on the conjunctiva.

The real nature of this affection in children was, however, recognized by other observers, even before Neisser's discovery. As early as 1878 an American physician, John Morris of Baltimore, ventured the assertion that gonorrhea is a frequent disease in little girls, infection being easy in them because of the prominence of the external genitals, and that contagion is often conveyed indirectly by a gonorrheal father or mother and may cause house epidemics.[1] Morris' article was not very widely read and it remained for Pott[2] in 1883 to call general attention to the great frequency of vaginitis in children and to state that this disease is usually gonorrheal and conveyed indirectly. Czéri's excellent article followed within two years, describing an epidemic of 26 cases in 25 of which he succeeded in isolating and cultivating the gonococcus. Czéri is outspoken in his conviction as to the gonorrheal nature of the chronic catarrhal vulvo-vaginitis of childhood. Indeed, he considers that the burden of proof rests upon those who hold that this disease is ever non-gonorrheal. He reviews Fraenkel's work and points out the flaws in the latter's reasoning, especially as to the failure of his inoculation experiments, which, performed as they were on dying children, were of little significance, while, on the other hand, there were four very significant cases of ophthalmia as a result of auto-infection occurring among Fraenkel's own cases. Czéri also disagrees with the old view that scrofulosis and malnutrition are the conditions usually predisposing to vulvo-vaginitis. His cases were well-nourished children. (This fact is noted also by Fischer, Cassel, and Cahen-Brach.) Widmarck and Lennander in 1885, Israel in 1886, and Spaeth in 1889, all succeeded in demonstrating the presence of gonococci in vulvo-vaginitis in little girls, the report of Widmarck including bacteriologic examination of the pus of gonococcal conjunctivitis as well.

Other writers, less thorough in their methods, diagnosed cases of infectious vaginitis as gonorrheal but without attempting to establish the fact by bacteriologic examination. (See the reports of Succhard, Comby, and Hofmokl.) There is little doubt in one's mind as one reads these articles that the disease was actually gonorrheal vaginitis, but the decisive proof is lacking. Hofmokl's attempt to differentiate between "spontaneous" vaginitis and blennorrhea on the ground of clinical symptoms, only leads to confusion and to the general impression that many, if not most, of the "spontaneous" cases were really gonorrheal. He adheres to the old theory that scrofula, malnutrition, anemia, uncleanness, etc., cause this form of vaginitis, yet he is obliged to admit that some of the cases in his clinic were strong, blooming girls, well cared for and cleanly. The disease often involved the urethra, rarely the bladder. It appeared in children of 1–8 years, while true blennorrhea was found in those between 8 and 12 years.

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[1] Morris was led to take this, at that time unusual, stand by observing the extremely contagious character of vulvo-vaginitis in children. He says: "The intense, specific virulence of the gonorrheal poison is markedly shown by its spread through a whole family, from one child to another."

[2] In the thesis of Skiba-Zaborowska we find the statement that, beginning with the year 1879, a systematic search for the gonococcus was made in all cases of youthful vulvo-vaginitis occurring in the service of O. Wyss in Zürich Hospital. These observations seem, however, not to have been published before the date of the above thesis, 1898.

In 1891 the diagnosis of gonorrheal vulvo-vaginitis was facilitated by a careful article by Epstein in which he described three cases of gonorrheal vaginitis in the new born, and in which he differentiated this form from the desquamative catarrhal vaginitis of the new born. The latter condition he states to be of frequent occurrence, lasting usually two or three weeks. It is characterized by a tenacious discharge, which in rare cases may be creamy like pus, but which under the microscope seems to consist of squamous epithelium chiefly, the total absence of leucocytes serving to distinguish it from a gonorrheal discharge. In premature or weakly children this desquamative catarrh may last longer than usual. Cassel, in 1893, describes such a discharge which had persisted from birth in an 18 months-old child.

GONORRHEAL AND NON-GONORRHEAL VAGINITIS.

The general view at the present time is that a large number of cases of chronic purulent or catarrhal vulvo-vaginitis in little girls are of gonorrheal origin. There remains, however, a difference of opinion as to the diagnosis and the frequency of this disease. It is obviously of the utmost practical importance, this question as to whether the chronic vaginitis of little girls is to be regarded as almost invariably gonorrheal or only occasionally so, and as to the possibility of making a fairly positive diagnosis of such cases. The majority of hospital epidemics of which we have reports were started by infection from an unrecognized case of gonorrheal discharge gaining entrance to the ward, and in all probability such an occurrence is often due to the widespread belief among physicians that a non-specific vulvo-vaginitis is very common in little girls and that the diagnosis of a gonorrheal vaginitis can be made only when the discharge presents a typical picture. It is undeniable that non-gonorrheal forms of vaginitis do occur in childhood. The question is how frequent they are. We have quite striking statistics as to the frequency of gonorrheal vaginitis reported by observers who have had the opportunity to study large numbers of such cases either in hospitals or dispensaries. Lennander found the gonococcus in all of his 18 cases of vaginitis; Rachford, in all of his 23. Czéri found it in 25 out of 26; Fischer, in 50 out of 54; Sheffield, in all 65; and Romnicéanu and Robin, in 130 out of 150. Others who have seen still larger numbers of cases, as Holt, Comby, Skutch, Welt-Kakels, do not give the exact figures but state that the great majority of those who came under their notice were gonorrheal. Holt says the non-specific cases number less than 5 per cent, and Pott, in his more recent articles, calls the chronic vulvo-vaginitis of children almost invariably gonorrheal, a statement concurred in by Prochownik, Buschke, Vogel, Berdal, Marfan, Jacobi, Rotch, Heimann, Edgar, Kimball, and LaFetra. On the other hand, we find traces of the older view, especially in French literature. An article by Vibert and Bordas in 1896 seems to have made a profound impression in that country. These authors took up the question from the medico-legal point of view and became convinced that not even the presence of the gonococcus could be taken as proof that the disease was "blennorrhagia." They based this statement on the fact that they found the gonococcus in the discharges of six cases of purely traumatic vulvo-vaginitis in little girls, and believed that they could rule out any possibility of gonorrheal infection in these cases. Cornil and Babes quote this view with approval, and Vassal indorses it emphatically. Marx maintains that not only is non-gonorrheal vaginitis far more common than the gonorrheal, but it is responsible for the severer complications, such as salpingo-ovaritis and peritonitis. Marx does not mention any bacteriologic studies of his cases. Henoch in his edition of 1892 describes an infectious form of vulvo-vaginitis in children, but states that he attaches little importance to such secretions for the reason that gonococci can be demonstrated in cases of vulvo-vaginitis in which no history of gonorrhea can be proven.

Even the most extreme upholders of the prevalence of gonorrheal infection in children recognize a non-specific vulvitis or vulvo-vaginitis caused by other microbic agents (diplococcus of Bockhart or of Fraenkel, streptococcus, staphylococcus), but claim that it differs from the gonorrheal clinically, as well as in the microscopic appearance of the discharge. It is more likely to be a pure vulvitis, it rarely involves the urethra (Spaeth, Fischer, Martin), is slightly if at all contagious, and is never complicated by ophthalmia. Various causes are assigned to this disease; trauma, including criminal assault; injury from foreign bodies; the irritation from pinworms, or from uncleanness, and the extension of non-gonorrheal inflammations of the labia. Fischer reports a case caused by the edema of heart disease, Cahen-Brach one which cleared up after the child was cured of obstinate constipation.

Such a discharge shows under the microscope few leucocytes and more numerous squamous cells than a gonorrheal discharge, and there are usually large numbers of bacteria of many kinds. In some cases, however, the differences are not so pronounced; there may be many leucocytes and some may contain diplococci, but these latter are Gram-positive and are therefore not to be confounded with the gonococcus. The diagnosis, then, in acute cases is not difficult. In long-standing cases, when the discharge has become thin and scanty, the matter is not so simple. To quote Levy and Klemperer, "although positive evidence of the presence of gonococci in microscopic preparation renders diagnosis of gonorrhea certain, negative evidence must be accepted with caution. It is known that when gonorrhea has existed for a considerable time gonococci are not always demonstrable in the rather mucoid secretion then present, but that nevertheless the gonorrhea may persist and still be infectious." Proof of the infectious character of a slight, non-purulent discharge in little girls is seen in Suchard's epidemic, in Hatfield's case, in Martin's experiment. Buschke says that many apparently bland discharges are due to an old gonorrhea, just as in the adult a chronic urethritis points to a gonorrheal history. Berdal makes the same statement.

That cultures may have to be made in some long-standing cases is shown by the experience of Heimann and of Welt-Kakels, both of whom succeeded in cultivating the gonococcus from a discharge, the smears from which showed no gonococci. Berggruen, also, and Park emphasize the necessity of making cultures in doubtful cases before a negative diagnosis is given. When this procedure is impossible it is generally conceded that a discharge rich in leucocytes and poor in bacteria should be regarded as very suspicious of gonorrhea.

Even in acute cases, the diagnosis may at first be difficult. Edgar states that the discharge is often free from gonococci during the first few days, the organisms appearing later. Nolén advises that in doubtful cases with thin scanty discharge a small amount of distilled water be injected into the vagina; which will result in the production, within 48 hours, of a profuse discharge in which gonococci can often be found.

Koplik, Berggruen, and Marx differ from the majority in respect to the frequency of non-gonorrheal chronic purulent vaginitis in childhood and as to its character. They recognize a non-gonorrheal form which is not due to trauma and which is clinically indistinguishable from the gonorrheal. Koplik describes it as a chronic purulent catarrh, often involving the urethra and sometimes the bladder, contagious, and caused by a specific, though as yet unrecognized, infection. The diagnosis depends upon the finding of many varieties of bacteria in the discharge, which, while full of pus cells, does not present the typical picture of gonorrhea. Berggruen does not recognize a case as gonorrheal unless he can cultivate the gonococcus from it. Marx thinks that the non-gonorrheal variety is much more common than the gonorrheal.

Heimann has gone into the question of specific and non-specific vaginitis in girls more thoroughly than anyone else in this country. He has succeeded in cultivating the gonococcus in cases where it did not appear in the smears. He found that in old discharges only degenerated cocci may be seen, and it may be impossible to find any typical organisms. Cultures were made from the vagina of 20 normal children and in no instance was the gonococcus found. Inoculation experiments in 2 males, with cocci isolated from these cases produced no urethritis, while similar experiments made with gonococci isolated from the gonorrheal discharge of little girls produced typical gonorrhea. Heimann believes there is a specific microorganism of catarrhal colpitis, perhaps the diplococcus of Bockhart or of E. Fraenkel, but there is no difficulty in distinguishing it from the gonococcus if Gram's stain is used. Even when cocci are found inside pus cells, they will invariably be shown to be Gram-positive unless the case is one of gonorrheal infection.

Veillon and Hallé made a very thorough study of the bacteriology of the normal vagina in childhood and of the discharge in the vulvo-vaginitis of children. They conclude that the gonococcus is the habitual cause of chronic vulvo-vaginitis in children; that it is present alone or almost alone during the acute stage; that later on it is associated with other bacteria and may be present in very small numbers; that non-gonorrheal vaginitis is rare and is not caused by any specific microbe. The same microbes are found in the non-gonorrheal discharge as are found in the normal vagina and consist of *B. pseudodiphtheriae*, *Streptococcus*, *Staph. albus*, and rarely *B. coli.* These organisms are also found in a gonorrheal discharge of long standing.

PREVALENCE OF GONORRHEA IN CHILDHOOD.

The importance of adult gonorrhea as a widely prevalent disease, chronic, highly infectious, and capable of producing serious and even fatal lesions is now universally recognized, and of late years we have begun to see that what is true of the disease in adults is true of the disease in children also. The frequency of gonorrhea in little girls was insisted upon by Pott as early as 1883, but though there are fairly numerous articles in German literature and scattered ones in French we find little on this subject in our own country, until we come to recent publications. Holt, Koplik, Welt-Kakels, Sheffield, Kimball, Trenwith, Rachford, have shown by the study of cases in hospitals and dispensaries how widespread the disease is, at least in our large cities. That so few hospitals and institutions for the care of children acknowledge the presence of this disease is far from being proof that they do not have it constantly. Holt's description of the fight carried on against this plague in the Babies' Hospital in New York shows that even under the strictest precautions it does gain entrance and spread. Surely we may assume that institutions, which make no attempt at all even to discover its presence, are in all probability more or less infected with it. Holt gives the results of examinations made by Dorothy Reed in institutions supposedly free from the disease and in which no precautions against infection were taken. She found in one place, among 100 infants and little girls, 12 with a purulent discharge containing gonococci, and 20 with a slight discharge in which the gonococcus could not be demonstrated. The statistics of the Babies' Hospital in New York show that there are about five or six cases of gonorrheal vaginitis among 125 applicants for admission.

The general impression among those who have studied this disease is that it is steadily increasing. This increase might be looked on as only apparent, for undoubtedly far more attention is paid to it now than formerly. Still it is undeniably true that in our large cities there is increasing opportunity all the time for infection from child to child. The tendency of modern city life is to bring large numbers of children together in close contact, in day nurseries, in hospitals (which are used far more than formerly), in kindergartens, in the schools, and in all manner of institutions for dependent children. An infected child who is kept at home will hardly spread the disease beyond her own family, but in a day nursery, or orphanage, or even a public school, she may be the cause of a widespread epidemic. And it is the growing conviction of physicians who have had experience in such institutions that, unless this disease can be excluded or controlled, a hospital or charitable institution for the care of little girls does more harm than good to the community. The public bathhouse and swimming-pool are recent innovations in our country, and we have not yet heard from them as conveyors of gonorrheal infection, but in all probability we shall not escape the experience of other countries in this respect.

MODES OF INFECTION

We may dismiss without further consideration those cases in which infection follows attempted criminal assault by a gonorrheal male, and discuss only the indirect methods of infection.[1] In cases which occur outside of institutions the source of infection is most often the mother, less often the father, sister, brother, or some other inmate of the house. Frequently the child has shared the bed of the infected adult, or has been bathed with the same sponge or towel. The mother's fingers also are often conveyors of the infection. Pott traced 90 per cent of his cases to the mother; Prochownik, 11 out of 16; Berggruen, 9 out of 13; Spaeth, 11 out of 14. Epstein's three cases were all infected during birth.

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[1] Infection from mother or other bedfellows may be direct, but is probably more often indirect.

Two interesting epidemics are described by Suchard. In an establishment for sulphur baths in Lavey a newly cemented bath-tub was used by 12 little girls with scrofula. One of the girls had a thin scanty vaginal discharge which suddenly became abundant and purulent. She was isolated and the bath thoroughly cleaned, but within three to six days all of the other girls developed the same trouble. A few months later 11 little girls, one boy, and a woman were bathed in another newly cemented tub. All of the girls developed purulent vaginitis during the following 17 days; the boy and the woman escaped infection. Suchard makes no mention of a bacteriological examination of the discharge.

The epidemic described by Skutch is the largest and most striking in the literature and is quoted in practically every article on vulvo-vaginitis of childhood. In 1891 there developed in Posen a wide-spread epidemic of this disease among girls, which was traced to the use of the public baths. Skutch reports 236 cases, developing within 14 days, and this hardly represents the whole number, for it was highly probable that many of the less serious cases never saw a physician. In this epidemic also, boys who were equally exposed to the infection escaped. This immunity of boys is noted by all observers, beginning with Fraenkel in 1885.

Infection in institutions is deplorably easy, and almost every object which enters into the equipment of a hospital or asylum has been accused as an agent of infection. The disease is practically invariably brought in by some child who is suffering from a vaginal discharge, more rarely ophthalmia, and in a few instances it is a boy with a gonorrheal proctitis. In institutions where children sleep two or more in a bed or are bathed in the same water, the mode of infection is not hard to trace. Sheffield's report of an epidemic in an orphanage is illustrative. They were accustomed in this institution to bathe from

20 to 30 girls at the same time in one great bath-tub. Sixty-five girls suffered in this epidemic. Even when the water is changed for each child, the bath-tub can undoubtedly be a conveyor of infection. Rectal thermometers were responsible for infections in Weill and Barjon's cases, in Baer's, in the epidemic at St. Annen Kinderspital in Vienna, mentioned by Fischer, and supposedly in other hospital epidemics. Bed linen, diapers, night clothes, water-closets, towels, all are regarded as probable causes of infection and those who have struggled to free an institution from this disease have in despair concluded that only complete isolation of the infected children, including isolation of their nurses, will serve to prevent further spread of the disease.

As one reads accounts of the attempts to combat the spread of gonorrhea in an institution for children, one is inclined to think that certain characteristics of the gonococcus have not been sufficiently considered. Experiments have shown conclusively that this organism is extremely sensitive to dryness and to a temperature above 45° C. (Neisser and Scholtz). Gonorrheal pus, which has been fully dried, contains no living germs, and even on bed linen, towels, etc., where drying takes place slowly, it can remain alive for only a few hours. The soaking of linen in disinfectants and then subjecting it to boiling temperature or to superheated steam, the strenuous cleansing of floor and walls, or the entire abandonment of an infected building would seem, therefore, to be unnecessary. On the other hand, the gonococcus can live for more than 24 hours[1] in warmth and moisture. All objects, therefore, which are damp and which come in contact with patient after patient in rapid succession should be regarded with the utmost suspicion. Such are the seats of water closets, bath-tubs, towels, sponges, clinical thermometers, and, most important of all, the fingers of nurses. This last danger seems to have been adequately emphasized only by Holt, who succeeded in tracing two cases of infection to the fingers of night nurses. In many hospitals, where the gonorrheal patients are supposedly isolated, special nurses are assigned to them by day only and the night nurse cares for non-gonorrheal cases as well. Undoubtedly infection has been carried in this way in more cases than those cited by Holt.

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[1] Schaffer and Steinschneider.

PREDISPOSING CAUSES.

The early view concerning the chronic vaginitis of children was that it arose spontaneously in ill-nourished, anemic, scrofulous little girls, and even down to the present day we find the statement frequently made that these conditions are strong predisposing causes of gonorrheal infection. It is not easy to decide on the value of the testimony on this point. Gonorrheal vaginitis is a disease which spreads in hospitals where naturally a large proportion of the children are scrofulous and anemic, and the same thing is unfortunately true of many institutions for children. On the other hand, children brought to dispensaries or seen in private practice with this disease are often apparently healthy and blooming. Hofmokl notes this fact with surprise; Fischer, Cahen-Brach, Cassel, and Czéri all say that the children seen by them were well nourished and not scrofulous.

As to the acute exanthematous diseases, there is certainly a general impression among physicians that a non-specific vulvo-vaginitis is a frequent sequela of scarlet fever and measles. Sheffield says that it is caused by saprophytic organisms. I can find no satisfactory description in the literature of the bacteriology of such a discharge nor any conclusive proof that it is not a gonorrheal vaginitis contracted within the hospital. Indeed, it seems very probable that many such cases are overlooked because of this idea that a discharge from the vagina is to be expected in measles and scarlet fever. Again, it is difficult to say whether these diseases increase the susceptibility to gonorrheal infection, or whether the facts cited in favor of this view can be explained on other grounds. Measles and scarlet fever are usually treated in hospitals; overcrowding is frequent during an epidemic and, as stated above, a vaginal discharge is not regarded as suspicious in such cases until other children have become infected, when its true character is discovered. It must be admitted that gonorrheal vaginitis spreads very quickly among children suffering from measles and scarlet fever. Fraenkel's 62 cases were almost all in the scarlet-fever ward. Cnopf, v. Dusch, and Weill and Barjon were convinced that both diseases increased the susceptibility to this infection. It is also noticeable that we do not find reports of epidemics of vulvo-vaginitis occurring in diphtheria wards.

COMPLICATIONS.

Gonorrheal arthritis and conjunctivitis have been so thoroughly discussed in the literature that it seems unnecessary to take them up in detail. It may be pointed out in passing that, while conjunctivitis as an infection secondary to vulvo-vaginitis is growing rarer all the time, the same does not seem to be true of arthritis. This is undoubtedly due to the fact that infection of the eye is almost invariably from without and precautions against it may be taken, while infection of the synovial membranes takes place through the blood stream (Wertheim) and cannot be guarded against. Holt and Kimball report eight very mysterious cases of arthritis in children under 3 months, where no port of entry could be discovered, and suggest that the gonococci were carried by the nurses' fingers in the act of washing out the babies' mouths.

Urethritis is variously regarded; as the primary disease (Cahen-Brach, Koplik); or as an almost invariable accompaniment of the vaginitis (Spaeth, Buschke, Fischer, Callari, Berggruen, Veillon et Hallé); or as a comparatively rare complication in childhood (Kaufmann, Skiba-Zaborowska, Skutch, v. Dusch). Usually an involvement of the urethra is taken as strong proof of the gonorrheal character of the inflammation, but this is not admitted by Koplik, who finds urethritis in non-gonorrheal inflammations also.

Proctitis seems to be a rare complication. Buschke had 4 cases among 50, Sheffield, 2 among 65. Cystitis is also rare; stomatitis is mentioned, but apparently Rozinski's five cases are the only ones in which gonococci were cultivated from the lesions. Ahlfeld reported a case of stomatitis in an infant, smears from the patches showing typical gonococci. Adenitis is probably rather common, but does not usually attract sufficient attention to gain more than passing mention. Sheffield had 12 cases in 148.

The most important question in the consideration of gonorrheal vaginitis from the point of view of the little patient herself is the question as to the involvement of the upper genital tract. Is this disease in children simply a vulvo-vaginitis or is it also an endocervicitis, leading to endometritis and involvement of tubes and ovaries? We know that in some cases, localized or general peritonitis has resulted from a gonorrheal vaginitis. As Wertheim pointed out, the gonococcus seems not to find the peritoneum a favorable ground and pure gonococcal infections are usually localized, chronic and not fatal. It is believed that this chronic peritonitis is not uncommon as a result of gonococcal infection in childhood and that it leads to the production of more or less serious lesions.

The mystifying cases of purulent salpingitis in young girls and of lesions pointing to an old peritonitis are explained as dating back to infantile gonorrhea by Saenger, Pott, Currier, Comby, Le Clerc, Edgar, and many more. Symptoms are often noted in the early stages of acute vaginitis which point to an involvement of the upper tract, such as rise of temperature, severe abdominal pains, enlargement and tenderness of the uterus, tenderness in the ovarial region, and, in other cases, all the symptoms of a severe peritonitis. A few of these cases have come to operation or autopsy and the nature of the infection has been proved by smears or cultures from the peritoneal cavity.[1] The infection is sometimes purely gonococcal, proving Wertheim's assertion that this organism alone can cause an ascending gonorrhea; in others the lesions in the peritoneum and especially in the organs are found to be due to mixed infection by the gonococcus and the streptococcus or to the latter alone. Rousseau believes that acute and fatal peritonitis is always due to a mixed infection.

Instances such as the above are, after all, exceptional, and it is much more important for us to know whether the uterus is involved in the ordinary case of gonorrheal vulvo-vaginitis when there are no clinical symptoms pointing to such involvement. If it is true that the apparently local disease may really cause such changes in uterus and tubes as to result in future sterility, then we shall be forced to regard a hospital epidemic of gonorrhea as an extremely serious thing. The obstinacy of the disease has led many to insist that it must penetrate to the uterus and thus remain unaffected by ordinary local treatment (Daphnis, Kaufmann, Jacobi). In all cases of acute vaginitis either gonorrheal or non-gonorrheal, which Koplik has

[1] I have been able to find in the literature only seven cases of gonococcal peritonitis or pyemia in little girls in which bacteriological examination is stated to have been made. These are the cases of Meyia, Dowd, Hunner and Harris (2), Hocheisen, Welt-Kakels, and Chiaisi and Isnardi. Others, in which there is strong probability that the infection was gonococcal, are the cases of Baginsky, Bracquehaye, Huber (2), Steven, Caillè, Saenger, Sigurd Lovén, Comby (8), Aguinet, Northrop. Marx says that pus was found in the Fallopian tubes in 5 out of 50 autopsies on little girls between 7 and 9 years of age, but no bacteriological examination was made, and Marx maintains that the vaginitis in these cases was not gonorrheal.

examined with the speculum, he has found the cervix red, swollen, and bathed in pus. He therefore thinks that the cervix is always involved in the process. Dind says that the cervical canal is the seat of predilection of the disease, not the vagina, but there is no satisfactory proof offered of this extreme statement. Lebedeff, working in Dind's clinic, stated that 29 of 56 cases examined through the speculum showed cervical involvement, but he based this belief on swelling, redness, and "fluor" bathing the cervix, and on the appearance of secretion on a tampon which had been laid against the external os. He mentions no microscopic examination of this secretion. Cahen-Brach and Skiba-Zaborowska had opportunity to examine the pelvic organs in four cases—two each—which came to autopsy from other causes, and they found no involvement above the vagina in any case. Gassmann took platinum loopfuls from the cervical canal in four cases and found three quite negative, the fourth contained pus cells but no gonococci. The largest number of such examinations is reported by Jung. He made smears from the cervical canal of little girls with gonorrheal vaginitis and found gonococci in 2 out of 20. One is inclined to think that this proportion is too small, both because no cultures were made and we know that gonococci sometimes are found in cultures when they are not discovered in the smears, and because Jung, for fear of error, rejected all cases in which gonococci were present in the vagina and portis vaginalis cervicis, accepting only those in which the organisms were exclusively in the cervical canal. However, even if his figures represent the exact truth, 10 per cent is no mean proportion.

DURATION OF THE DISEASE.

Authorities are generally agreed as to the obstinacy and long duration of this disease in childhood, even when the most approved treatment is given. Occasionally optimistic articles may be found in the literature describing modes of treatment which resulted in rapid cure (Sheffield, Rachford, Agramonte), but the majority seem to believe that an apparent cure is deceptive, that it means only a temporary remission, and that the disease may remain latent for long periods only to reappear months later. Buschke reports a case which lasted four years. Epstein thinks eight or nine years is not impossible.

Welt-Kakels saw cases in which the discharge had persisted for years before an acute exacerbation caused the parents to bring the child for treatment. The acute stage would then subside under treatment after four to six weeks, but a thin scanty flow would replace the purulent discharge and this would prove exceedingly persistent. She declares that no disease in childhood is more tenacious and refractory. The obstinacy of the disease is by most authors considered a diagnostic point in favor of gonococcal origin, but others as Berggruen and Sheffield find their supposedly non-specific cases fully as obstinate.

DESCRIPTION OF EPIDEMIC IN SCARLET-FEVER WARDS.

During the months between July 20, 1907, and January 1, 1908, a series of epidemics of gonorrheal vulvo-vaginitis appeared in the scarlet-fever wards of Cook County Hospital. Scarlet fever was at the time very prevalent throughout the city and as there is but one hospital in Chicago for the acute contagious diseases, the scarlet-fever wards were very much overcrowded. When the first epidemic of vulvo-vaginitis broke out, the visiting staff advocated the isolation in separate rooms of all little girls entering the hospital, until it could positively be ascertained that they were free from gonorrheal infection, in order to avoid a second epidemic of this disease. The municipal authorities, however, insisted on the hospital admitting cases of scarlet fever up to the full capacity, and this precaution could never be carried out. As a result of the admission to the wards of children with latent gonorrheal vaginitis, five or six epidemics of the disease broke out and 82 infants and little girls were involved. For the opportunity to study these cases I am indebted to the courtesy of Dr. W. L. Baum, to whom I wish to express my sincere gratitude.

The hospital received during that time cases of diphtheria, measles, and chicken-pox, but the gonorrheal infection involved only the scarlet-fever wards. During the course of convalescence from scarlet fever and while still suffering from the vaginitis, certain of the little girls developed measles and a larger group developed chicken-pox. These children were then moved into the appropriate wards and occasionally a child without vaginitis was admitted to the measles and chicken-pox wards, but not one of the latter acquired vaginitis, although in the same room with these vaginitis cases. Girls over 13 years of age and boys of all ages escaped infection even when every little girl in a given ward was attacked.

The children ranged from 13 months to 13 years of age, 61 (75 per cent) being under 7 years and only 5 over 10 years. Except for the scarlatinal infection, no predisposing cause was apparent. Many of the children were well nourished and free from any taint, and these children developed quite as serious a form of the disease as the anemic ones.

The diagnosis was made in all 82 cases by repeated examination of smears from the vaginal discharge; cocci identical with the gonococcus in morphology, distribution, and staining properties being found in each instance. In 11 cases cultures were made on ascites agar, 10 yielding the gonococcus, the 11th proving sterile. Only two of the 10 were pure cultures of the gonococcus. The others contained in order of frequency *B. pseudodiphtheriae*, *Staph. albus*, *Streptococcus* and *Staph. citreus*. Not one case of non-gonorrheal purulent vaginitis was found during this time.

Each epidemic was caused by the admission of a child suffering with gonorrheal vaginitis and a study of these occurrences would convince the most skeptical of the danger lurking in an apparently non-specific catarrhal discharge from the vagina of a little girl. For instance, in October a child entered a scarlet-fever ward which was quite free from gonorrhea. She had a slight vaginal discharge, smears from which were examined repeatedly by the internes, but no gonococci were discovered until the ninth day after admission. Meantime the child used the same bath-tub as the other children, went to the same water closet, and was attended by the same nurse. It would also often happen that she would be lifted into another child's bed while hers was being made, and vice versa. None of the children except the babies wore diapers. After the discovery of gonococci in her discharge she was isolated, but nine little girls from that ward developed gonorrheal vaginitis within five to seven days.

The history of another epidemic shows that three sisters were admitted, all with slight vaginal discharge. For 10 days examinations were made of these discharges but no gonococci found. The head nurse states that, as a precaution, these children were not tubbed nor allowed the use of the closet. Rectal thermometers were not at that time used for any girl patients. The children were, however, in a large ward with other little girls, and cared for by the same nurses. After 10 days' time, gonococci appeared in the discharge of one of the three sisters and on the following two days in the discharges of the other two. Eighteen cases were more or less positively traced to this source of infection. Another child, who infected nine, was in the hospital for four weeks with a thin scanty, apparently non-gonococcal discharge. It became suddenly profuse and purulent. She was isolated, but the disease appeared in nine little girls who had shared the ward with her. Of the 82 cases, 16 entered with a pronounced or slight vaginal discharge, 66 acquired the disease in the hospital. Very strict precautions were taken after the disease developed; the children were isolated with special day and night nurses and apparently the disease did not spread from these wards. The responsible agent seemed in each instance to be a child with a latent, unrecognized gonorrhea, which apparently had been roused to activity by the scarlatinal infection. In several instances we had a demonstration of the fact that an acute exanthematous disease may light up into activity a previously latent gonorrhea. For instance, R. S., a little girl who had contracted vaginitis in the hospital, was convalescent from scarlet fever and so far recovered from her vaginitis that she had no visible discharge and one negative smear had been obtained. She contracted chicken-pox and the vaginal discharge reappeared with numerous gonococci. In other cases, not so near to complete recovery as this one, a decided exacerbation occurred on the outbreak of a second infectious disease.

As to complications, one can speak with certainty only of three cases of conjunctivitis, one very severe but resulting in complete recovery, the other two not quite so severe. All were proved by microscopic examination to be due to gonococcal infection. Four children had arthritis, but it was the opinion of the clinicians that these were scarlatinal, not gonococcal. One little girl had suppuration of a vulvo-vaginal gland, and although no microscopic examination was made of the pus, it is probable that this was an extension of her gonorrhea.

The disease varied greatly in intensity, light and severe cases appearing in the same epidemic. As to the duration, it is difficult to say anything positive. Many children were removed by their parents before the vaginal discharge had subsided, others after the discharge had ceased but before the gonococci had disappeared. There are notes at hand of 29 cases which were dismissed apparently cured, i. e., they were free from discharge and the vaginal smears showed no gonococci. It was possible to follow 10 of these 29 children after they left the hospital. Three remained apparently free from gonococci for at least six weeks (the last time they were seen). The other seven all relapsed within a short time. Four of them are at the moment of writing still under treatment, the disease having already lasted from 10 to 13 weeks.

The important points in the history of this hospital epidemic are: the apparent predisposition to gonorrheal infection caused by scarlet fever; the fact that no girl over 13 years of age was infected; the total absence of Koplik's non-specific purulent vaginitis; and the fact that the infection was introduced into the hospital by children with vaginal discharge which was apparently non-gonorrheal. In conclusion, a table is appended of the epidemics of gonorrheal vulvovaginitis of children reported in the literature, and also of observations of scattered cases in dispensaries and private practice.

TABLE 1.

SUMMARY OF CASES OF VULVO-VAGINITIS IN CHILDREN.

Name and Place*	Number of Vaginitis Cases Examined	Number of Gonorrheal Cases	Age	Bacteriological Examination	Supposed Mode of Infection	Complications
Atkinson, Institution Baltimore, 1878		6	5–12 years	None made	Infection carried by fingers of girls from eyes (conjunctivitis) and mouth (stomatitis)	Conjunctivitis and stomatitis were regarded as primary, vulvitis as secondary
Lennander, Hospital Stockholm, 1885	10	7		Gonococcis found 5 times in vagina, 2 in urethra;		2 urethritis
	18	18	2–11 years	Gonococcis found in all	Indirect infection in hospital	
Fraenkel, Hospital, Hamburg, 1885		8	5, 6, and 9 years	Coccus identical with Neisser's gonococcis in all	No isolation or precautions against transmission	4 conjunctivitis
		26				
		25				
Leszynsky, Institution New York City, 1886		35	3–15 years. Majority under 5	None made	Fingers of children	18 conjunctivitis
Czéri, Hospital, Buda-Pesth, 1885	26	25	3–10 years	By culture in 25 cases	Direct contact with one case; also indirectly by means of bed linen, lavatories, instruments, bandages	
Widmarck, Stockholm, 1885		12	20 months to 9 yrs.	Gonococci found in all	From mother or other members of family by sponges, towels, bed linen	Conjunctivitis
		8	2 mos. to 9 yrs.	Gonococci found in all		
Israel Dispensary, Copenhagen, 1886	23		15 under 5 yrs.; 8 over 5 yrs.	11 cases examined; gonococci in 9	Doubtful	
Pott, Hospital, Halle, 1883		44	27 from 1–5 yrs.; 4 over 10 yrs.	None made	From mother in 90 per cent of cases; others from relatives or house mates	Inguinal adenitis
Ditto 1888		42	29 from 1–5 yrs.; 3 over 10 yrs.	21 examined; gonococci in 17		
Dusch, Hospital, Heidelberg, 1888		19	1½ to 12 yrs.	Gonococci found in all	Hospital cases by nurses' hands; outside cases by other members of family, indirectly	
Olliver, Hospital, Paris, 1888		15		No mention	Nurses' hands, sponges, etc.	
Suchard, Sulphur Baths, Lavey, 1888		12		No mention	Use of same bath tub; one child with slight discharge	
		11		No mention	Use of same bath tub	
Spaeth, Dispensary, Hamburg, 1889	21	14	3–11 yrs.	Gonococci found in vagina and urethra in 14	Indirectly from mother in 11 cases; 1 case of rape; 1 hospital infection	Urethritis in all
Skutch, Public Bathhouse, Posen, 1891		236	6–14 yrs.	Gonoccoci found in majority of cases	Use of public bath-tubs; two or more bathed in same water	Many cases of urethritis and conjunctivitis

* For references see alphabetical list at the end of this article.

TABLE 1—*Continued.*

Name and Place*	Number of Vaginitis Cases Examined	Number of Gonorrheal Cases	Age	Bacteriological Examination	Supposed Mode of Infection	Complications
Cahen-Brach, Hospital, Graz and Frankfurt a. M., 1892	26	25	1½ to 12 yrs. 19 under 7 yrs.	Gonococci found in 25 cases	Attempted criminal assault in 6; others by sleeping with infected persons	23 urethritis; 1 conjunctivitis; 1 arthritis; 1 cystitis
Martin. Dispensary, Philadelphia, 1892		9		5 examined; gonococci in all	Direct in 1; indirect from mother in 1	2 urethritis; in several endometritis (clinically diagnosed)
Comby, Hospital, Paris, 1891		151	69 between 13 mos. and 5 yrs.	No mention	Indirect infection	1 conjunctivitis
Berggruen, Dispensary, Vienna, 1893	31	13	1–13 yrs.; majority under 8 yrs.	Gonococci in 13 cases, 7 purulent, 10 catarrhal	From mother, father, or other bedfellow	1 conjunctivitis; urethritis in many; pain and tenderness in ovarial region
Cassel, Dispensary, Berlin, 1893		30	7 mos. to 11 yrs. Majority between 2 and 3 yrs.	Gonococci found in 24 cases	From mother, father, or other bedfellow	2 conjunctivitis; 19 urethritis
Koplik, Dispensary, New York, 1893	24	17	2–10 yrs. Majority under 6 yrs.	Goconocci found in 17 cases	Sleeping with infected persons	Urethritis and endocervicitis in majority
Vassol. Hospital, Bordeaux, 1894		14	75 per cent, 2 to 5 yrs.	None made	In 8 cases mother had leucorrhea and slept with children	1 conjunctivitis; 1 otitis (?)
Weill et Barjon, Hospital Lyons, 1894		20		Gonococci found in all	Use of same rectal thermometer from infected child	
Fischer, Hospital, Altona, 1895	54	50	32 under 6 yrs.; 14 bet. 6 and 12 yrs.	Gonococci found in 50 cases	Direct and indirect contact in family and hospital	Urethritis in majority; 1 Bartolinitis
Veillon et Hallé, Hospital Paris, 1896	21	17	3 days to 11 yrs. Majority 2 and 6 yrs.	Gonococci found in 17; cultures in 17	No mention	1 conjunctivitis
Agramonte. Dispensary, New York, 1896		32	5 mos. to 10½ yrs.	Gonococci found in some cases	Direct and indirect	2 cystitis
Cnopf. Hospital, Nuremberg, 1898		10	3 mos. to 8 yrs.	Gonococci found in all	Nurse's hands conveyed infection from cases of ophthalmia in babies	
Skiba-Zaborowska. Hospital, Zürich, 1898		71	2 weeks to 7 yrs. chiefly. Only 7 over 10 yrs.	34 examined; gonococcus in 29	Infection traced in 58, chiefly by thermometers, sponges, towels	5 conjunctivitis; 2 arthritis; 1 urethritis; 1 fatal peritonitis
Sheffield, Institution, New York City, 1900		65		Gonococci found in smears and cultures	Simultaneous use of one large bath-tub by 20–30 girls	6 conjunctivitis; 4 local peritonitis; 2 proctitis; 2 arthritis; 1 endometritis
		32			Common use of beds and small bath-tubs	

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* For references see alphabetical list at the end of this article.

TABLE 1—*Continued.*

Name and Place*	Number of Vaginitis Cases Examined	Number of Gonorrheal Cases	Age	Bacteriological Examination	Supposed Mode of Infection	Complications
Romnicèanu et Robin, Hospital, Bucharest, 1901	150	130	1–13 yrs.; about 50 per cent under 7 yrs.	Gonococci found in 130 cases	15 cases of attempted criminal assault; others by sleeping with infected persons	
Callari, Italy, 1901		54			27 attempted criminal assault; 27 indirect infection	49 urethritis; 21 arthritis; 1 endocervicitis
Buschke Hospital and Dispensary, Berlin, 1902		50	2 mos. to 14 yrs.	Gonococci found in majority	7 attempted criminal assault; others by mother, father, or other inmates of home	49 urethritis; 3 proctitis; 1 conjunctivitis; 1 cystitis; 1 Bartolinitis
Baer, Hospital, Chicago, 1904		19	6 mos. to 13 yrs.	Gonococci found in all; cultures from 2	By rectal thermometers, bed-linen, etc.	1 conjunctivitis; 1 arthritis; 1 peritonitis (clinically diagnosed)
Welt-Kakels Hospital, New York, 1904	192	Great Majority	Up to 13 yrs. Majority 2 to 6 yrs.	Gonococci found in majority; culture from 1	Indirect from cases in hospitals or from bedfellows at home	2 conjunctivitis; 1 cystitis; 1 peritonitis; 4 arthritis
Jung, Dispensary, Berne, 1904		20	2–9 yrs.	Gonococci found in all		2 endocervicitis
Holt. Hospital, New York, 1905		273	All under 3 yrs.	Examination made after 1896; gonococci found	Nurse's hands, rectal thermometers, bath-tubs, linen, diapers, fingers of children	6 conjunctivitis; 4 arthritis
Rachford. Hospital, Cincinnati, 1906		23		Gonococci found in all	Rectal thermometers, bed linen, diapers, bath-tubs	Non
Trenwith, Dispensary, New York, 1906		12		Gonococci found in all	75 per cent infected by mother or father	None
Author's Epidemic, Hospital, Chicago, 1907		82	13 mos. to 13 yrs.; 75 per cent under 7 yrs.	Gonococci found in all; cultures in 10	Indirect from unrecognized cases of gonorrhea	3 conjunctivitis; 1 abscess of vulvo-vaginal gland

* For references see alphabetical list at the end of this article.

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